

Section 102 and 103 rejections. As now presented, the claims recite an invention which is not anticipated under 102 nor made obvious under 103 by any combination of the cited references MORI JPN 05/317287, PAULY 5,280,245; and MOONEN 5,570,019.

Our invention "obtains parameters relevant to imaging including type of pulse sequence, repetition time, echo time, number of echoes, field of view and imaging matrix size, and number of slices" and using same "calculates a predicted SAR" then "compares the predicted SAR with a predetermined limit of a standard SAR"; then adjusts the (a) SLR pulse waveform, or (b) changes the pulse width while leaving unmodified otherwise the SLR waveform, or (c) changes number of RF pulses, or (d) a combination of the foregoing, to "control the predicted SAR to be within the predetermined limit without reducing the number of slices during the repetition time".

In the prior art, keeping the predicted SAR within the predetermined limit of a standard SAR was by reducing the number of slices" This led to problems of degrading of efficiency.

In contrast, we have found that we can do the same by changing the RF pulse characteristics as above stated.

None of the prior art does this. Surely Mori, Pauly, and Moonen considered singly or in combination do this.

Going to the primary reference MORI, he only creates a SAR model, and prohibits a pulse sequence or warns if a value of the model exceeds the limit value. IT DOES ADJUST THE RF PULSES IN THE PULSE SEQUENCE AS DOES THE INSTANT INVENTION TO CONTROL THE

SAR. MORI's disclosures is completely different in object, approach, and functions from the instant invention. Clearly, the two are nowhere close to each other, and there is no 102 "anticipation" by Mori of the instant invention.

Moreover, the disclosures of Pauly and Moonen provide ways of reducing SAR value by using predetermined RF pulses mainly. The instant invention does not do this; rather our recited invention "adjusts" the RF pulses in the manner recited according to the predicted SAR to not exceed the SAR limit of the standard SAR.

The flow chart of FIG. 10 describes the invention which is set forth in the claims. It more clearly shows how different the instant invention is from the cited art Mori, Pauly and Moonen. No extension of any combination of the cited references would make obvious the method steps recited in the claims.

In view of the forego, applicant respectfully solicits reconsideration and allowance.

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Claims 1-15, (cancelled)

Claim 16, (previously cancelled)

Claim 17, (cancelled)

18. (new) A spin excitation method for exciting spins within an object to be imaged by a pulse sequence containing RF pulses, said method comprising the steps of:

predicting a specific absorption rate of said object to be imaged in executing said pulse sequence;

comparing said predicted specific absorption rate with a predetermined limit of a standard specific absorption rate; and of the following characteristics of the RF Pulses: (a)

(b) adjusting at least one [among] number of pulses, (pulse wave-

form and (c) pulse width of said RF pulses in said pulse sequence  
[so that] <sup>wherein</sup> <sub>without reducing the number</sub> said predicted specific absorption rate value is within said predetermined limit, and thereby prevent reduction of slices for improving during a repetition time period [and improve] imaging efficiency.

19. (new) The method of claim 18, wherein said RF pulses to be adjusted are 180° pulses.

20. (new) The method of claim 18, wherein adjustment of pulse waveform is provided by modification from a Shinnar-LeRoux pulse waveform to a sinc pulse waveform.

21. (new) The method of claim 18, wherein adjustment of pulse waveform is provided by modification from an SLR pulse waveform to a waveform obtained by filtering said SLR pulse waveform.

22. (new) The method of claim 21, wherein said filtering is done by use of a Hamming filter.

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23.(new) A spin excitation apparatus for exciting spins within an object to be imaged by a pulse sequence containing RF pulses, said apparatus comprising:

means for predicting a specific absorption rate of said object to be imaged in executing said pulse sequences;

means for comparing said predicted specific absorption rate with a predetermined limit of a standard specific absorption rate and

of the following characteristics of the RF pulses: (a)

means for adjusting at least one (among) number of pulses, (b) pulse waveform and pulse width of said RF pulses in said pulse sequence [so that] <sup>wherein</sup> [said predicted specific absorption rate value] is within said predetermined limit [without reducing the number and thereby prevent reduction] <sub>for improving</sub> of slices during a repetition time period [and improve] imaging efficiency.

24.(new) The apparatus of claim 23, wherein said means for adjusting comprises means for adjusting 180° RF pulses.

25.(new) The apparatus of claim 23, wherein said means for adjusting comprises means for adjusting pulse waveform by modifying a Shinnar-LeRoux pulse waveform to a sinc pulse waveform.

26.(new) The apparatus of claim 23, wherein said means for adjusting comprises means for adjusting pulse waveform by modifying an SLR pulse waveform to a waveform obtained by filtering said SLR pulse waveform.

27.(new) The apparatus of claim 26, wherein said means for adjusting further comprises means for filtering including a Hamming filter.

28. (new) A magnetic resonance imaging apparatus comprising:  
means for generating a static magnetic field in a space containing an object to be imaged;  
means for generating a gradient magnetic field in said space;  
means for transmitting an RF excitation signal to said space;  
means for receiving a magnetic resonance signal from said space; and  
means for producing an image based on said received magnetic resonance signal, wherein  
said means for transmitting includes a spin excitation apparatus for exciting spins within said object to be imaged by a pulse sequence containing RF pulses, said excitation apparatus comprising:  
means for predicting a specific absorption rate of said object to be imaged in executing said pulse sequence;  
means for comparing said predicted specific absorption rate with a predetermined limit of a standard specific absorption rate; and  
of the following characteristics of the RF pulses: (a)  
(b) means for adjusting at least one [among] number of pulses,  
pulse waveform and <sup>(c)</sup> pulse width of said RF pulses in said pulse sequence <sup>so that</sup> [and] said predicted specific absorption rate value is within said predetermined limit [and thereby prevent reduction of slices during a repetition time period and improve] imaging efficiency.

29. (new) The apparatus of claim 28, wherein said means for adjusting comprises means for adjusting 180° RF pulses.

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30. (new) The apparatus of claim 28, wherein said means for adjusting comprises means for adjusting pulse waveform by modifying a Shinnar-LeRoux pulse waveform to a sinc pulse waveform.

31. (new) The apparatus of claim 28, wherein said means for adjusting comprises means for adjusting pulse waveform by modifying an SLR pulse waveform to a waveform obtained by filtering said SLR pulse waveform.

32. (new) The apparatus of claim 31, wherein said means for adjusting further comprises means for filtering including a Hamming filter.

33. (new) A magnetic resonance imaging method comprising the steps of:

- (A) generating a static magnetic field in a space containing an object to be imaged;
- (B) generating a gradient magnetic field in said space;
- (C) transmitting an RF excitation signal to said space;
- (D) receiving a magnetic resonance signal from said space; and
- (E) producing an image based on said received magnetic resonance signal; wherein

procedure

      said transmitting step <sup>(C.)</sup> includes a spin excitation <sup>[method]</sup> for exciting spins within said object to be imaged by a pulse <sup>procedure</sup> further sequence containing RF pulses, said spin excitation <sup>[method]</sup> comprising the steps of:

- (I) predicting a specific absorption rate of said object to be imaged in executing said pulse sequence;

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(II.) comparing said predicted specific absorption rate with a predetermined limit of a standard specific absorption rate; and of the following characteristics of the RF pulses: (a) (III.) adjusting at least one [among] number of pulses, pulse waveform and pulse width of said RF pulses in said pulse sequence <sup>(6)</sup> wherein [so that] said predicted specific absorption rate value is within said predetermined limit <sup>without reducing the number of slices for improving</sup> and thereby prevent reduction of slices during repetition time period [and improve] imaging efficiency.

34. (new) The method of claim 33, wherein said RF pulses to be adjusted are 180° RF pulses.

35. (new) The method of claim 33, wherein adjustment of pulse waveform is provided by modification from a Shinnar-LeRoux pulse waveform to a sinc pulse waveform.

36. (new) The method of claim 33, wherein adjustment of pulse waveform is provided by modification from an SLR pulse waveform to a waveform obtained by filtering said SLR pulse waveform.

37. (new) The method of claim 36, wherein said filtering is done by use of a Hamming filter.